

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)**

**CLASS: M.Tech/PRE-PHD
BRANCH: EEE**

**SEMESTER : II/NA
SESSION : SP/2023**

**SUBJECT: EE583R1 RENEWABLE SOURCES OF ELECTRICAL ENERGY AND GRID INTEGRATION
TIME: 3 Hours FULL MARKS: 50**

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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Q.1(a)	While integrating the source with the grid, differences in voltage, frequency, and phase sequence across the synchronizing switch are very much important factors before and after the synchronization "Justify and defend with proper equations.	[5]	2 3
Q.1(b)	Applying the basic principle of Solar PV (SPV) cell, defend the following statements (i) SPV is a current source to some extent (ii) SPV has one maximum power at one irradiance level.	[5]	2,5 3
Q.2(a)	Draw the complete block diagram of grid-tied SPV system with all controllers. Develop the equations with the description of the way of calculation of each component of the equations that ensure both voltage and current controllers for DC power control of PV panel. Interpret how can the desired power be regulated through the controllers.	[3+4]	2,4 6
Q.2(b)	Develop proper equation for voltage control of DC link capacitor and explain the importance of the controller.	[3]	2,4 4
Q.3(a)	Design the controllers by creating all the proper equations for grid tied inverter that ensure to regulate real and reactive power.	[5]	4,5 6
Q.3(b)	Explain the different ways to regulate voltage of PCC point by DER as per IEEE 1547-2018 standards.	[5]	4.5 5
Q.4(a)	Justify that the maximum mechanical power extraction from wind kinetic energy with fixed wind velocity happens at one tip speed ratio value at the entire angular speed of the wind turbine and it is 59% of total kinetic energy.	[5]	3 4
Q.4(b)	Describe four quadrant mode of operation of Doubly Fed Induction Motor.	[5]	3 4
Q.5(a)	Analyze different steps required for battery selection for an application.	[5]	1 3
Q.5(b)	Describe in brief about hydrogen and fuel cell technology	[5]	1 4

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